

9 January 2019
Reference: 0455217.0142

Mr. Tim Benton
Weston Solutions, Inc.
1090 King George Post Road
Suite 201
Edison, NJ 08837



Re: Whole Effluent Toxicity Test Results

Dear Tim:

Enclosed please find the final results of the following Chronic Toxicity Test performed on samples of the Tonawanda Coke Corporation Outfall 004 effluent.

- 13 December 2018, Chronic *Ceriodaphnia dubia* Toxicity Test
- 13 December 2018, Chronic *Pimephales promelas* Toxicity Test

If you have any questions concerning this report or if I can be of any further assistance to you, please feel free to contact me at (616) 738-7308 or via e-mail at bruce.rabe@erm.com.

Sincerely,



Bruce A. Rabe
Director, Aquatic Toxicology Laboratory

BAR:km
Enclosures: Whole Effluent Toxicity Test Report
cc: File

FINAL REPORT

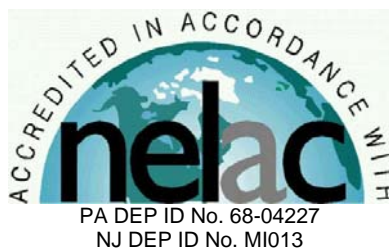
Chronic Toxicity Test
Freshwater Invertebrate,
Ceriodaphnia dubia
EPA Test Method 1002.0

Submitted To:
Weston Solutions, Inc.
1090 King George Post Road
Suite 201
Edison, New Jersey 08837

Sample: Tonawanda Coke Corp. - Outfall 004

Testing Period: 13 – 20 December 2018

Laboratory I.D. Number: 121318-9



Conducted By:
Environmental Resources Management, Inc.
3352 128th Avenue
Holland, Michigan 49424



Test Overview



Permittee: Tonawanda Coke Corporation
Location: 3875 River Road
Tonawanda, New York 14150
Contact: Robert Kuberka
Telephone #: 716.876.6222

SPDES Permit #: NY0002399
Permit Requirements: Acute Toxicity Limit = 0.3 TUa
Chronic Toxicity Limit = 1.0 TUc
Test Sample: Outfall 004
Receiving Water: Niagra River

Testing Date: 13 – 20 December 2018

Sample Dates: 12 December 2018
14 December 2018
17 December 2018

Test/Method: Daphnid, *Ceriodaphnia dubia*,
Survival and Reproduction Test
EPA 821-R-02-013 Method
1002.0.

QC Objectives: Test data met all test
acceptability criteria, except
where noted below.

Data Qualifiers: See Case Narrative.

DATA SUMMARY

Effluent Concentrations (%)	Survival (%)	Reproduction (Average Young/Female)
Lab Control	100	20.7
Upstream Control	100	21.0
6	100	22.8
13	100	21.1
25	100	20.4
50	100	18.2
100	90	16.6

TEST RESULTS

48-Hour LC ₅₀	>100%
NOEC	100%
LOEC	>100%
IC ₂₅	>100%
MSDp (Reproduction)	31.6%
TUa (100 / LC ₅₀)	0.3
TUc (100 / NOEC)	1.0

TEST CONCLUSION

In accordance with the SPDES permit requirements for Tonawanda Coke Corp., this toxicity test did not exhibit either acute or chronic toxicity.

Bruce A. Rabe
Director, Aquatic
Toxicology Laboratory
ERM Project No. 0455217.0142

Environmental Resources Management
3352 128th Avenue
Holland, Michigan 49424-9263
Phone: 616.399.3500
Fax: 616.399.3777



ERM Testing Method

Ceriodaphnia dubia – Survival and Reproduction Toxicity Test



Upon sample receipt, the effluent and receiving water samples were visually inspected for indigenous organisms and analysed for a suite of water quality parameters (Appendix A - Table 1). Where indigenous organisms were present, samples were filtered through a 60 micron (μm) NITEX® screen. All samples were maintained at 0 – 6 degrees Celsius ($^{\circ}\text{C}$) until needed for testing.

A series of five effluent concentrations and two controls (dilution control and laboratory control) were established for testing. Effluent concentrations were prepared by mixing appropriate volumes of dilution water and effluent in the test containers. Dilution water consisted of receiving water. The control solutions consisted of 100 percent receiving water and 100 percent reconstituted moderately hard water.

Ceriodaphnia dubia used to initiate this test were obtained from individual, in-house cultures and were less than 24-hours old, and had an age range of 0 to 8 hours at test initiation. Test organisms used to initiate this test were released from adults which met acceptable performance criteria (i.e., ≥ 15 young/surviving female within 3 broods and obtained from a brood of at least 8 young) and were maintained in reconstituted moderately hard water prior to test initiation.

The *Ceriodaphnia dubia* test was conducted using 30-milliliter (mL) disposable polystyrene containers containing 15 mL of control water or test solution. One *Ceriodaphnia dubia* was added to each test chamber with ten replicate chambers per treatment. Each *Ceriodaphnia dubia* test chamber was fed a 0.2-mL suspension consisting of yeast-Cerophyll-trout chow (YCT) and green algae (*Raphidocelis subcapitata*) mixture daily.

The test solutions were renewed daily during the exposure by transferring the adult daphnid, by way of a wide bore pipette, into fresh control water or test solution.

Percent survival of exposed *Ceriodaphnia dubia* was determined by inspecting for adult mortality daily. Mortality was defined as no body or appendage movement after gentle prodding. Production of young was also determined by daily inspections and enumeration. When 60 percent of the surviving females in the control treatment produced three broods, mean reproduction was determined by calculating the average number of live young produced per female for each treatment.

The test was conducted at a temperature of $25 \pm 1^{\circ}\text{C}$ under fluorescent lighting with a photoperiod of 16 hours light and 8 hours dark. Water quality measurements were performed on all control and test solutions prior to test initiation and on selected treatments daily thereafter, as indicated in the raw data (Appendix A - Table 2).

Following termination of the chronic toxicity test, No Observed Effect Concentrations (NOEC) and Lowest Observed Effect Concentrations (LOEC) were determined for *Ceriodaphnia dubia* survival and reproduction, and a 25 percent Inhibition Concentration (IC_{25}) was determined for *Ceriodaphnia dubia* reproduction. An NOEC is defined as the highest effluent concentration that does not produce any observed adverse effect to the exposed test organism. An LOEC is defined as the lowest effluent concentration that does produce an observed adverse effect to the exposed test organism. An adverse effect is determined as a statistically significant difference between the control and a given effluent concentration. Significant differences in *Ceriodaphnia dubia* survival were determined using the Fisher's Exact Test.

Prior to the determination of any significant differences in *Ceriodaphnia dubia* reproduction, the data were evaluated for normal distribution and homogeneity characteristics. Depending on the result and the number of test replicates per concentration, an analysis of variance test was performed followed by one of the following mean comparison tests: Dunnett's Procedure, Bonferroni t-Test, Steel's Many-One Rank Test, Wilcoxon Rank Sum Test, or the T-Test. For reporting purposes, a chronic toxic unit (TUC) is calculated and is defined as the most conservative of either 100/NOEC based on the more sensitive test endpoint or 100/IC₂₅.

To evaluate acute toxicity, a 48-hour LC₅₀ and corresponding 95 percent confidence interval was also calculated, where possible. If the LC₅₀ calculation was not possible (e.g. greater than 50 percent survival) then the 100 percent effluent response was compared to the control for a statistical difference (e.g. T-Test). The LC₅₀ value estimate was determined by using one of the following statistical methods: graphical, Spearman-Kärber, Trimmed Spearman-Kärber, or Probit. The method selected for reporting test results was determined by the characteristics of the data; that is, the presence or absence of 0 and 100 percent mortality and the number of concentrations in which mortalities between 0 and 100 percent occurred. For reporting purposes, the 48-hour LC₅₀ value was converted to an acute toxic unit (TUa) by 100/LC₅₀. For 48-hour LC₅₀ values greater than 100 percent in which there is a statistical difference between the control and 100 percent effluent, the TUa is reported as 1.0 TUa. In cases where there is no statistical difference between the control and 100 percent effluent, the TUa is reported as 0.3 TUa. All statistical analyses were performed using the CETIS™ Version 1.9.4.3 software program.

The reference toxicant, sodium chloride, was used to monitor the sensitivity of the test organisms and the precision of the testing procedure. Chronic reference toxicant tests are performed at least monthly and the resulting IC₂₅ are plotted to determine if the results are within prescribed limits (Appendix A - Standard Reference Toxicant Data). If the IC₂₅ of a particular reference toxicant test does not fall within the expected range of \pm two standard deviations from the mean for a given test organism, the sensitivity of that organism and the overall

credibility of the test system is suspect.

Reference:

USEPA. 2002. Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, 4th Ed. U.S. Environmental Protection Agency, Office of Water, Washington, D.C., EPA-821-R-02-013.

Case Narrative



1.0 *TEST PERFORMANCE CRITERIA*

The quality control results achieved laboratory specifications.

2.0 *MODIFICATIONS TO ERM'S STANDARD TEST METHOD*

Test was performed in accordance with ERM's standard test method (see page 3).

3.0 *DATA QUALIFIERS*

Due to shipping issues which caused delay in the receipt of the third effluent sample, sample 2 was used for test renewals beyond the 72-hour holding time limit.

Appendix A
Supporting Documents

- *Raw Test Data*
- *Statistical Analysis (if necessary)*
- *Chain-of-Custody Forms*
- *Standard Reference Toxicant Data*

**Environmental
Resources
Management**

**Ceriodaphnia dubia - Chronic Toxicity Test
Initial Water Quality and Test Solution Preparation**

Table 1
Page 1 of 1

Permittee/Client: Tonawanda Coke Corp.
Effluent/Location: Outfall 004
Lab I.D.#: 121318-9
Beginning Date: 12/13/18 Time: 1200
Ending Date: 12/20/18 Time: 1200

Control/Dilution Water: RMHW
Organism Batch #: 231-18
Organism Age: 14-19 hours
QC Review: KM
QC Review Date: 12/21/18

Initial Water Quality:

Parameter	Units	Effluent			Upstream Receiving Water			Synthetic Water	
Sample #	--	1	2	3	1	2	3	--	--
Lab I.D.#/ Batch #	--	121318-9	121518-7	121918-2	121318-11	—	—	97-18	—
Temperature	° C	2	1	2	3	—	—	--	--
Dissolved Oxygen	mg / L	13.2	12.8	13.8	13.7	—	—	--	--
pH	S.U.	7.3	6.8	6.8	7.6	—	—	7.8	—
Conductivity	umhos/cm	407	452	467	326	—	—	332	—
Alkalinity	mg / L CaCO ₃	120	94	120	120	—	—	60	—
Hardness	mg / L CaCO ₃	120	120	120	100	—	—	58	—
Total Ammonia	mg / L NH ₃	0.4	0.4	3.2	0.1	—	—	--	--
Total Residual Chlorine	mg / L Cl ₂	<0.01	10.91	<0.01	<0.01	—	—	<0.01	—
Total mls of Sodium Thiosulfate added per liter	mg / L	--	--	--	--	--	--	--	--
Initials	--	ms	cn	my	my	—	—	ms	—

Test Solution Preparation:

Treatment (% Effluent)	Effluent (mL)	Dilution (mL)	Test Day	Initials	Upstream Sample #	Effluent Sample #	Synthetic Batch #
Lab Control	0	1200	0	cn	1	1	97-18
Control - Upstream	0	1200	1	ms	1	1	97-18
6%	72	1128	2	ms	1	2	97-18
13%	156	1044	3	ms	1	2	97-18
25%	300	900	4	cn	1	2	97-18
50%	600	600	5	ms	1	2	97-18
100%	1200	0	6	ms	1	3	97-18
			7	SPR	—	—	—

Environmental
Resources
Management

Ceriodaphnia dubia - Chronic Toxicity Test
Water Quality Data

Table 2
Page 1 of 1

Permittee/Client: Tonawanda Coke Corp.
Effluent/Location: Outfall 004
Lab I.D.#: 121318-9

Water Quality Data:

Dissolved Oxygen (mg/L)														
Day														
Meter #	5	5	5	5	5	5	5	5	5	3	3	5	5	5
Treatment (% Effluent)	0	1		2		3		4		5		6		7
	I	F	I	F	I	F	I	F	I	F	I	F	I	F
Lab Control	8.3	7.7	8.3	7.3	8.3	7.9	8.5	8.3	8.7	8.2	8.4	7.2	8.2	8.0
Control - Upstream	8.4	7.8	8.6	7.0	8.4	7.8	8.6	8.2	8.6	8.1	8.4	7.1	8.1	8.0
6%	8.4	7.8	8.3	7.0	8.4	7.8	8.6	8.4	8.6	8.2	8.4	7.1	8.0	8.0
13%	8.4	7.8	8.4	7.1	8.4	8.0	8.6	8.4	8.7	8.3	8.4	7.1	8.0	8.0
25%	8.5	7.9	8.4	7.2	8.4	8.0	8.6	8.4	8.7	8.3	8.3	7.1	8.0	8.0
50%	8.5	8.0	8.4	7.1	8.4	8.0	8.6	8.3	8.7	8.3	8.3	7.1	7.9	7.9
100%	8.5	8.0	8.4	7.3	8.5	8.0	8.6	8.4	8.7	8.3	8.3	7.1	7.7	8.0
pH (S.U.)														
Day														
Meter #	8	8	8	8	8	8	8	10	10	10	10	8	8	6
Treatment (% Effluent)	0	1		2		3		4		5		6		7
	I	F	I	F	I	F	I	F	I	F	I	F	I	F
Lab Control	7.8	7.8	7.9	7.8	7.9	7.8	8.0	8.1	7.8	7.9	7.8	7.4	7.8	7.9
Control - Upstream	7.6	8.0	7.9	8.0	7.9	7.9	7.9	8.2	7.4	7.9	7.3	7.6	7.6	7.8
6%	--	8.0	--	8.0	--	8.0	--	8.2	--	8.0	--	7.7	--	7.9
13%	--	8.1	--	8.1	--	8.0	--	8.2	--	8.0	--	7.8	--	7.9
25%	--	8.1	--	8.2	--	8.1	--	8.2	--	8.1	--	7.9	--	7.9
50%	--	8.2	--	8.3	--	8.1	--	8.2	--	8.0	--	7.9	--	7.9
100%	7.7	8.2	7.7	8.2	7.8	8.1	7.7	8.2	7.6	8.1	8.6	8.0	7.7	7.9
Conductivity (umhos/cm)														
Day														
Meter #	1	--	1	--	1	1240	1	--	1	--	1	--	1	--
Treatment (% Effluent)	0	1		2		3		4		5		6		7
	I	F	I	F	I	F	I	F	I	F	I	F	I	F
Lab Control	326	--	329	--	329	--	329	327	329	--	331	332	328	--
Control - Upstream	329	--	331	--	327	--	335	327	332	--	340	334	331	--
6%	334	--	336	--	338	--	345	335	339	--	351	342	340	--
13%	340	--	342	--	347	--	345	--	348	--	365	357	353	--
25%	351	--	353	--	362	--	361	--	364	--	366	--	370	--
50%	370	--	372	--	396	--	393	--	395	--	398	--	409	--
100%	411	--	414	--	458	--	455	--	458	--	461	--	481	--
Temperature (°C)														
Day														
Meter #	5	5	5	5	5	5	5	5	5	3	3	5	5	5
Treatment (% Effluent)	0	1		2		3		4		5		6		7
	I	F	I	F	I	F	I	F	I	F	I	F	I	F
Lab Control	24	24	24	24	25	24	24	24	24	24	25	24	24	24
Control - Upstream	24	24	24	24	24	24	25	24	24	24	25	24	24	24
6%	24	24	24	24	24	24	25	24	24	24	25	24	24	24
13%	24	24	24	24	24	24	25	24	24	24	25	24	24	24
25%	24	24	24	24	24	24	25	24	24	24	25	24	24	24
50%	24	24	24	24	25	24	25	24	24	24	25	24	24	24
100%	24	24	25	24	25	24	25	24	24	24	25	24	26	24
I = Initial Chemistry F = Final Chemistry														

Note: D.O. meter also used for temperature measurement unless otherwise noted.

**Environmental
Resources
Management**

**Ceriodaphnia dubia - Chronic Toxicity Test
Survival and Reproduction Data**

Table 3
Page 1 of 2

Permittee/Client: Tonawanda Coke Corp.
Effluent/Location: Outfall 004
Lab I.D.#: 121318-9

Treatment (% Effluent)	Day No.	Replicate										Average Young/ Female	Number of Live Adults (%)	Average Young/ Female % CV
		1	2	3	4	5	6	7	8	9	10			
Lab Control	1	--	--	--	--	--	--	--	--	--	--		10	
	2	--	--	--	--	--	--	--	--	--	--		10	
	3	--	--	--	--	--	--	--	--	--	--		10	
	4	3	5	6	8	5	6	8	5	3	2		10	
	5	--	9	10	7	9	9	7	10	9	7		10	
	6	5	--	--	3	--	--	--	--	--	12		10	
	7	16	11	9	8	8	2	7	9(1)	7	8(4)		10	
Totals:		24	25	25	16	22	17	19	24	19	16	20.7	400	--
# Broods (% 3rd Brood)		3	3	3	3	3	3	3	3	3	3	(100)		
Control - Upstream	1	--	--	--	--	--	--	--	--	--	--		10	
	2	--	--	--	--	--	--	--	--	--	--		10	
	3	--	--	--	--	--	--	--	--	--	--		10	
	4	2	6	5	6	6	6	3	6	5	4		10	
	5	--	9	11	--	8	9	--	8	10	12		10	
	6	3	--	--	5	--	--	2	--	--	--		10	
	7	7	6(1)	11	5	5	12	5(2)	11	9	13		10	
Totals:		12	21	27	16	19	27	10	25	24	24	21.0	(100)	31.4
# Broods (% 3rd Brood)		3	3	3	3	3	3	3	3	3	3	(100)		
6%	1	--	--	--	--	--	--	--	--	--	--		10	
	2	--	--	--	--	--	--	--	--	--	--		10	
	3	--	--	--	--	--	--	--	--	--	--		10	
	4	4	6	3	--	5	6	1	5	5	5		10	
	5	11	8	6	--	7	11	8	8	9	9		10	
	6	--	--	--	--	--	--	--	--	--	--		10	
	7	11	10	13	1	7	8	11	20	17	13		10	
Totals:		26	24	22	1	19	25	20	33	31	27	22.9	(100)	30.8
13% <i>Run OK</i>	1	--	--	--	--	--	--	--	--	--	--		10	
	2	--	--	--	--	--	--	--	--	--	--		10	
	3	--	--	--	--	--	--	--	--	--	--		10	
	4	5	4	6	4	7	4	8	5	6	3		10	
	5	10	11	9	--	9	10	5	9	8	7		10	
	6	--	--	--	--	--	--	--	--	--	--		10	
	7	15	8	--	7	9	9	6	14	7	12		10	
Totals:		30	23	13	13	23	24	15	28	21	22	21.2	(100)	27.0
25% <i>Run OK</i>	1	--	--	--	--	--	--	--	--	--	--		10	
	2	--	--	--	--	--	--	--	--	--	--		10	
	3	--	--	--	--	--	--	--	--	--	--		10	
	4	4	6	4	5	5	6	5	6	4	3		10	
	5	6	9	9	6	11	12	8	9	9	8		10	
	6	--	--	--	--	--	--	--	--	--	--		10	
	7	13	7	5	2(1)	1(1)	--	10	15	6	9		10	
Totals:		23	22	18	13	17	18	21	30	19	23	20.4	(100)	22.4
50%	1	--	--	--	--	--	--	--	--	--	--		10	
	2	--	--	--	--	--	--	--	--	--	--		10	
	3	--	--	--	--	--	--	--	--	--	--		10	
	4	4	5	4	2	5	5	5	5	6	4		10	
	5	10	7	5	--	7	10	5	9	4	4		10	
	6	--	--	--	3	--	--	--	--	--	--		10	
	7	8	8	12	3(1)	4	6	3(1)	13	4	12		10	
Totals:		22	20	21	8	16	21	13	27	14	20	16.2	(100)	30.0
100%	1	--	--	--	--	--	--	--	--	--	--		10	
	2	--	--	--	--	--	--	--	--	--	--		10	
	3	--	--	--	--	--	--	--	--	--	--		10	
	4	5	5	3	3	4	6	1	4	4	--		10	
	5	8	10	5	--	7	9	6	5	4	4		10	
	6	--	--	--	3	--	--	--	--	--	--		10	
	7	11	15	8	4	5(1)	2(1)	8(1)	8	12	9		9	
Totals:		24	30	16	10	16	17	9	9	20	15	16.6	(90)	40.6

X = DEAD ADULT

1X = DEAD ADULT, ONE YOUNG PRODUCED BEFORE DEATH

-- = NO YOUNG RECORDED

(E) = ABORTED EMBRYOS /EGGS

(1) = ONE DEAD YOUNG

(S) = SPLIT BROOD

* = 4th BROOD EXCLUDED FROM TOTAL

Permittee/Client: Tonawanda Coke Corp.
Effluent/Location: Outfall 004
Lab I.D.#: 121318-9

Brood Board Information:

Brood Board Information:											
Replicate	1	2	3	4	5	6	7	8	9	10	Brood Board Date: 12/05/18
Chamber Number	51	51	21	1	5	35	55	40	20	10	Young Age Range: 14-19 hours

Test Information:

Test Information: <i>2011</i>								
	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
YCT Batch #:	<i>20-18</i>	<i>21-18</i>	<i>21-18</i>	<i>21-18</i>	<i>21-18</i>	<i>21-18</i>	<i>21-18</i>	<i>—</i>
Algae Batch #:	<i>29-18</i>	<i>29-18</i>	<i>30-18</i>	<i>30-18</i>	<i>30-18</i>	<i>30-18</i>	<i>30-18</i>	<i>—</i>
Observation Time:	<i>1200</i>	<i>1300</i>	<i>1400</i>	<i>1130</i>	<i>1430</i>	<i>1530</i>	<i>1300</i>	<i>1200</i>
Initials:	<i>RW</i>	<i>CM</i>	<i>CM</i>	<i>CM</i>	<i>RW</i>	<i>KM</i>	<i>CM</i>	<i>SPR</i>
Date:	<i>12/13/18</i>	<i>12/14/18</i>	<i>12/15/18</i>	<i>12/16/18</i>	<i>12/17/18</i>	<i>12/18/18</i>	<i>12/19/18</i>	<i>12/20/18</i>

Comment Section:

[illegible]

CETIS Analytical Report

Report Date: 21 Dec-18 13:07 (p 1 of 2)
Test Code/ID: 2F32FC1 / 00-4949-1905

Ceriodaphnia 7-d Survival and Reproduction Test

ERM

Analysis ID: 15-2545-3117	Endpoint: 7d Survival Rate	CETIS Version: CETISv1.9.4
Analyzed: 21 Dec-18 13:07	Analysis: STP 2xK Contingency Tables	Status Level: 1
Batch ID: 15-7376-1715	Test Type: Reproduction-Survival (7d)	Analyst: Lab Tech
Start Date: 13 Dec-18 12:00	Protocol: EPA/821/R-02-013 (2002)	Diluent: Receiving Water
Ending Date: 20 Dec-18 12:00	Species: Ceriodaphnia dubia	Brine:
Test Length: 7d 0h	Taxon: Branchiopoda	Source: In-House Culture Age: <24
Sample ID: 11-0083-3427	Code: 419D6293	Project: WET Compliance Testing
Sample Date: 12 Dec-18 09:25	Material: Industrial Effluent	Source: Tonawanda Coke Corp.
Receipt Date: 13 Dec-18 10:00	CAS (PC):	Station: Outfall 004
Sample Age: 27h (2 °C)	Client: Tonawanda Coke Corp.	

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	TU
Untransformed	C > T	100	>100	n/a	1

Fisher Exact/Bonferroni-Holm Test

Control	vs	Group	Test Stat	P-Type	P-Value	Decision(α:5%)
Upstream Contr		6	1.0000	Exact	1.0000	Non-Significant Effect
		13	1.0000	Exact	1.0000	Non-Significant Effect
		25	1.0000	Exact	1.0000	Non-Significant Effect
		50	1.0000	Exact	1.0000	Non-Significant Effect
		100	0.5000	Exact	1.0000	Non-Significant Effect

Test Acceptability Criteria

Attribute	Test Stat	Lower	Upper	Overlap	Decision
Control Resp	1	0.8	>>	Yes	Passes Criteria

Data Summary

Conc-%	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
0	U	10	0	10	1	0	0.0%
6		10	0	10	1	0	0.0%
13		10	0	10	1	0	0.0%
25		10	0	10	1	0	0.0%
50		10	0	10	1	0	0.0%
100		9	1	10	0.9	0.1	10.0%

7d Survival Rate Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	U	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
6		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
13		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
25		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
50		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
100		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000

7d Survival Rate Binomials

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	U	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
6		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
13		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
25		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
50		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
100		1/1	1/1	1/1	1/1	1/1	1/1	1/1	0/1	1/1	1/1

CETIS Analytical Report

Report Date: 21 Dec-18 13:07 (p 2 of 2)
Test Code/ID: 2F32FC1 / 00-4949-1905

Ceriodaphnia 7-d Survival and Reproduction Test

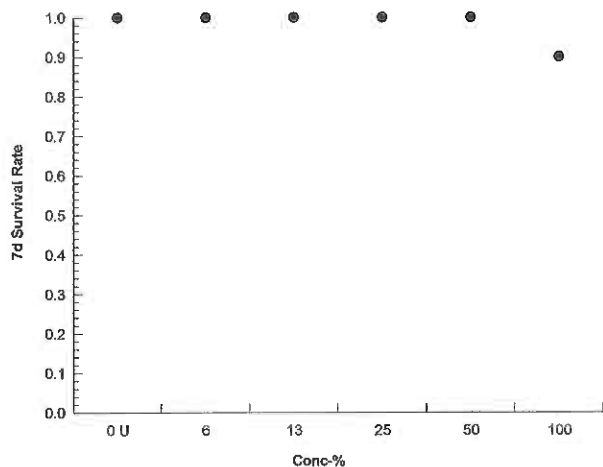
ERM

Analysis ID: 15-2545-3117
Analyzed: 21 Dec-18 13:07

Endpoint: 7d Survival Rate
Analysis: STP 2xK Contingency Tables

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 21 Dec-18 13:08 (p 1 of 2)
Test Code/ID: 2F32FC1 / 00-4949-1905

Ceriodaphnia 7-d Survival and Reproduction Test

ERM

Analysis ID: 03-7025-7884	Endpoint: Reproduction	CETIS Version: CETISv1.9.4
Analyzed: 21 Dec-18 13:07	Analysis: Parametric-Control vs Treatments	Status Level: 1
Batch ID: 15-7376-1715	Test Type: Reproduction-Survival (7d)	Analyst: Lab Tech
Start Date: 13 Dec-18 12:00	Protocol: EPA/821/R-02-013 (2002)	Diluent: Receiving Water
Ending Date: 20 Dec-18 12:00	Species: Ceriodaphnia dubia	Brine:
Test Length: 7d 0h	Taxon: Branchiopoda	Source: In-House Culture Age: <24
Sample ID: 11-0083-3427	Code: 419D6293	Project: WET Compliance Testing
Sample Date: 12 Dec-18 09:25	Material: Industrial Effluent	Source: Tonawanda Coke Corp.
Receipt Date: 13 Dec-18 10:00	CAS (PC):	Station: Outfall 004
Sample Age: 27h (2 °C)	Client: Tonawanda Coke Corp.	

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	C > T	100	>100	n/a	1	31.62%

Dunnett Multiple Comparison Test

Control	vs	Conc-%	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Upstream Contr		6	-0.6206	2.289	6.64	18	CDF	0.9559	Non-Significant Effect
		13	-0.06895	2.289	6.64	18	CDF	0.8530	Non-Significant Effect
		25	0.2069	2.289	6.64	18	CDF	0.7647	Non-Significant Effect
		50	0.9653	2.289	6.64	18	CDF	0.4323	Non-Significant Effect
		100	1.517	2.289	6.64	18	CDF	0.2116	Non-Significant Effect

Test Acceptability Criteria

Attribute	Test Stat	Lower	Upper	Overlap	Decision
Control Resp	21	15	>>	Yes	Passes Criteria

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	252.333	50.4667	5	1.2	0.3218	Non-Significant Effect
Error	2271.6	42.0667	54			
Total	2523.93		59			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	4.395	15.09	0.4941	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9699	0.9459	0.1451	Normal Distribution

Reproduction Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	U	10	21	16.28	25.72	22.5	10	29	2.087	31.43%	0.00%
6		10	22.8	16.47	29.13	24.5	1	33	2.796	38.78%	-8.57%
13		10	21.2	16.99	25.41	22.5	13	30	1.861	27.76%	-0.95%
25		10	20.4	17.13	23.67	20	13	30	1.447	22.43%	2.86%
50		10	18.2	14.3	22.1	20	8	27	1.724	29.96%	13.33%
100		10	16.6	11.78	21.42	16	9	30	2.13	40.58%	20.95%

Reproduction Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	U	12	21	27	16	19	27	10	25	24	29
6		26	24	22	1	19	25	20	33	31	27
13		30	23	13	13	23	24	15	28	21	22
25		23	22	18	13	17	18	21	30	19	23
50		22	20	21	8	16	21	13	27	14	20
100		24	30	16	10	16	17	9	9	20	15

CETIS Analytical Report

Report Date: 21 Dec-18 13:08 (p 2 of 2)
Test Code/ID: 2F32FC1 / 00-4949-1905

Ceriodaphnia 7-d Survival and Reproduction Test

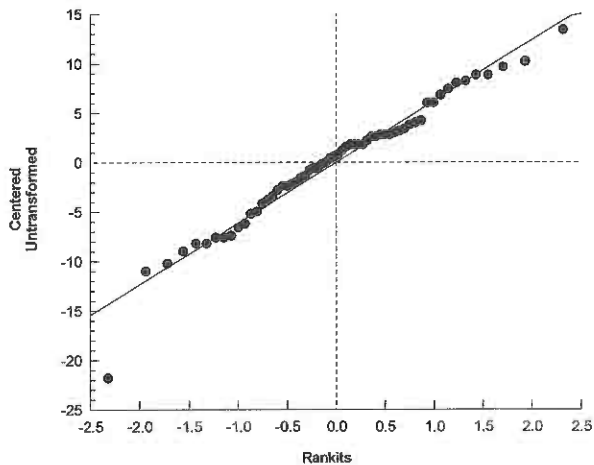
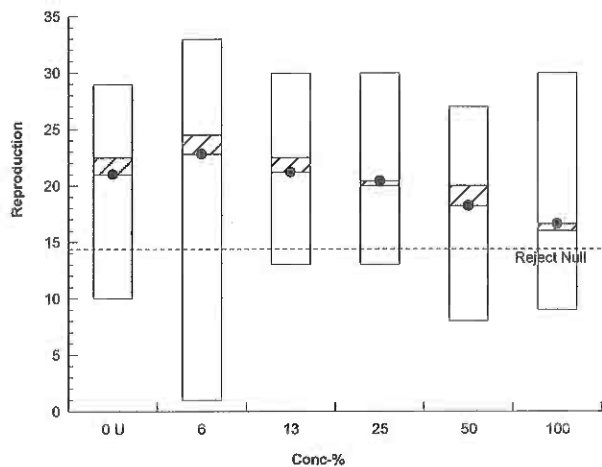
ERM

Analysis ID: 03-7025-7884
Analyzed: 21 Dec-18 13:07

Endpoint: Reproduction
Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 21 Dec-18 13:08 (p 1 of 2)
Test Code/ID: 2F32FC1 / 00-4949-1905

Ceriodaphnia 7-d Survival and Reproduction Test

ERM

Analysis ID: 09-5940-8788	Endpoint: Reproduction	CETIS Version: CETISv1.9.4
Analyzed: 21 Dec-18 13:07	Analysis: Linear Interpolation (ICPIN)	Status Level: 1
Batch ID: 15-7376-1715	Test Type: Reproduction-Survival (7d)	Analyst: Lab Tech
Start Date: 13 Dec-18 12:00	Protocol: EPA/821/R-02-013 (2002)	Diluent: Receiving Water
Ending Date: 20 Dec-18 12:00	Species: Ceriodaphnia dubia	Brine:
Test Length: 7d 0h	Taxon: Branchiopoda	Source: In-House Culture Age: <24
Sample ID: 11-0083-3427	Code: 419D6293	Project: WET Compliance Testing
Sample Date: 12 Dec-18 09:25	Material: Industrial Effluent	Source: Tonawanda Coke Corp.
Receipt Date: 13 Dec-18 10:00	CAS (PC):	Station: Outfall 004
Sample Age: 27h (2 °C)	Client: Tonawanda Coke Corp.	

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Log(X+1)	Linear	2125587	200	Yes	Two-Point Interpolation

Test Acceptability Criteria

TAC Limits

Attribute	Test Stat	Lower	Upper	Overlap	Decision
Control Resp	21	15	>>	Yes	Passes Criteria

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC5	18.01	1.049	58.88	5.554	1.698	95.29
IC10	31.12	3.2	n/a	3.214	n/a	31.25
IC15	43.91	10.7	n/a	2.277	n/a	9.347
IC20	67.19	18.43	n/a	1.488	n/a	5.425
IC25	>100	n/a	n/a	<1	n/a	n/a
IC40	>100	n/a	n/a	<1	n/a	n/a
IC50	>100	n/a	n/a	<1	n/a	n/a

Reproduction Summary

Calculated Variate

Isotonic Variate

Conc-%	Code	Count	Mean	Min	Max	Std Dev	CV%	%Effect	Mean	%Effect
0	U	10	21	10	29	6.6	31.43%	0.0%	21.9	0.0%
6		10	22.8	1	33	8.842	38.78%	-8.57%	21.9	0.0%
13		10	21.2	13	30	5.884	27.76%	-0.95%	21.2	3.2%
25		10	20.4	13	30	4.575	22.43%	2.86%	20.4	6.85%
50		10	18.2	8	27	5.453	29.96%	13.33%	18.2	16.89%
100		10	16.6	9	30	6.736	40.58%	20.95%	16.6	24.2%

Reproduction Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	U	12	21	27	16	19	27	10	25	24	29
6		26	24	22	1	19	25	20	33	31	27
13		30	23	13	13	23	24	15	28	21	22
25		23	22	18	13	17	18	21	30	19	23
50		22	20	21	8	16	21	13	27	14	20
100		24	30	16	10	16	17	9	9	20	15

CETIS Analytical Report

Report Date: 21 Dec-18 13:08 (p 2 of 2)
Test Code/ID: 2F32FC1 / 00-4949-1905

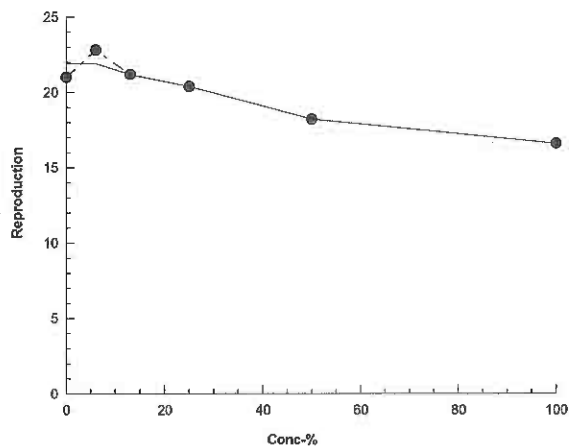
Ceriodaphnia 7-d Survival and Reproduction Test

ERM

Analysis ID: 09-5940-8788 Endpoint: Reproduction
Analyzed: 21 Dec-18 13:07 Analysis: Linear Interpolation (ICPIN)

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



DateShipped: 12/14/2018

CarrierName: FedEx

Airbill No: 773975881367

CHAIN OF CUSTODY RECORD

Case #:

Contact Name: Tim Benton

Contact Phone: (732) 585-4425

No: 2-121418-114000-0018

Cooler #: 1

Lab: Environmental Resources Management

Lab Phone: 616-399-3500

[illegible]

Special Instructions: Chronic Toxicity Test - Method: EPA-821-R-02-013

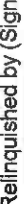

Daphnid - Method 1002.0

Fathead Minnow - Method 1000.0

48 Hour Prelim Results: Two weeks written. Email Results to

Tim.Benton@WestonSolutions.com and Patrick.Buster@WestonSolutions.com

SAMPLES TRANSFERRED FROM	CHAIN OF CUSTODY #
--------------------------	--------------------

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
1/sample	 WESTON	12/14/18 1500	FedEx		
			 Coleman	12/15/18 1000	Cold

DateShipped: 12/17/2018

CarrierName: FedEx

AirbillNo: 77399646440

CHAIN OF CUSTODY RECORD

Case #:

Contact Name: Tim Benton

Contact Phone: (732) 585-4425

No: 2-121718-114628-0019

Cooler #: 1

Lab: Environmental Resources Management

Lab Phone: 616-399-3500

[illegible]

Special Instructions: Chronic Toxicity Test - Method: EPA-821-R-02-013

Daphnid - Method 1002.0


Fathead Minnow - Methd 1000.0

48 Hour Prelim Results, Two weeks written. Email Results to

Tim.Benton@WestonSolutions.com and Patrick.Buster@WestonSolutions.com

SAMPLES TRANSFERRED FROM

CHAIN OF CUSTODY #

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
1/sample	 WESTON	12/17/18 1500	FedEx		
			Colleen Agel/Ten	12/19/18 1030	* out of hold time
					FedEx Express/Fawell

CHAIN OF CUSTODY RECORD

Case #:

Contact Name: Tim Benton

Contact Phone: (732) 585-4425

No: 2-121218-132710-0015

Cooler #: 3

Lab: Environmental Resources Management

Lab Phone: 616-399-3500

[illegible]



Special Instructions: Chronic Toxicity Test - Method: EPA-821-R-02-013

Daphnid - Method 1002.0

Fathead Minnow - Method 1000.0

48 Hour Prelim Results: Two weeks written. Email Results to

Tim.Benton@WestonSolutions.com and Patrick.Buster@WestonSolutions.com

Special Instructions: Chronic Toxicity Test - Method: EPA-821-R-02-013				SAMPLES TRANSFERRED FROM	
Daphnid - Method 1002.0					
Fathead Minnow - Method 1000.0				CHAIN OF CUSTODY #	
48 Hour Prelim Results, Two weeks written. Email Results to Tim.Benton@WestonSolutions.com and Patrick.Buster@WestonSolutions.com					
Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
1/sample	 Weston Solutions	12/14/18 1500	 Weston Solutions	12/13/18 1000	

CHAIN OF CUSTODY RECORD

Case #:

Contact Name: Tim Benton

Contact Phone: (732) 585-4425

No: 2-121218-132805-0016

Cooler #: 4

Lab: Environmental Resources Management

Lab Phone: 616-399-3500

[illegible]

Special Instructions: Chronic Toxicity Test - Method: EPA-821-R-02-013

Daphnid - Method 1002.0



Fathead Minnow - Methd 1000.0

48 Hour Prelim Results. Two weeks written. Email Results to

Tim.Benton@WestonSolutions.com and Patrick.Buster@WestonSolutions.com

SAMPLES TRANSFERRED FROM

CHAIN OF CUSTODY #

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
1 sample	 WESTON	12/14/18 1500	 Remy	12/15/18 1000	

CHAIN OF CUSTODY RECORD

Case #

Contact Name: Tim Benton

Contact Phone: (732) 585-4425

No: 2-121218-132857-0017

Cooler #:

Lab: Environmental Resources Management

Lab Phone: 616-399-3500

[illegible]

Special Instructions: Chronic Toxicity Test - Method: EPA-821-R-02-013



Daphnid - Method 1002.0

Fathead Minnow - Methd 1000.0

48 Hour Prelim Results, Two weeks written. Email Results to

Tim.Benton@WestonSolutions.com and Patrick.Buster@WestonSolutions.com

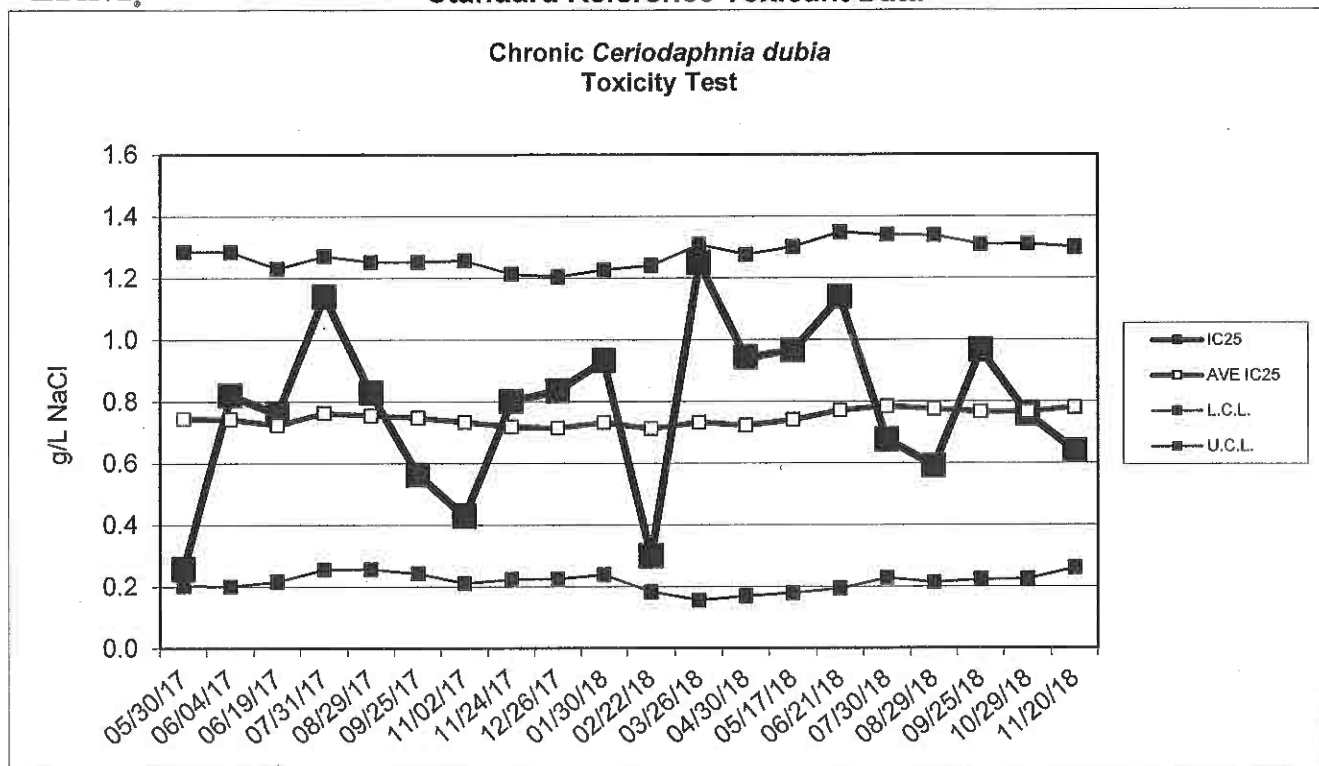
SAMPLES TRANSFERRED FROM	CHAIN OF CUSTODY #
--------------------------	--------------------

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
1/ Sample	 T. Weston	12/12/18	 T. Weston	12/13/18 1000	



Environmental Resources Management

Standard Reference Toxicant Data



Chronic *Ceriodaphnia dubia* Toxicity Test Data

Date	IC25 (g/L NaCl)	AVE IC25 (g/L NaCl)	CONTROL LIMIT Lower	Upper	Survival (%)	CONTROL Reproduction (ave. young)	CV (%)
04/12/17	0.40	0.8	0.3	1.3	100	34.4	16.8
05/30/17	0.26	0.7	0.2	1.3	100	34.4	12.5
06/04/17	0.82	0.7	0.2	1.3	90	31.0	22.6
06/19/17	0.76	0.7	0.2	1.2	100	28.8	9.2
07/31/17	1.14	0.8	0.3	1.3	100	31.2	17.3
08/29/17	0.83	0.8	0.3	1.3	100	29.7	18.0
09/25/17	0.56	0.7	0.2	1.3	100	25.5	17.1
11/02/17	0.43	0.7	0.2	1.3	100	28.0	11.8
11/24/17	0.80	0.7	0.2	1.2	100	21.0	37.4
12/26/17	0.83	0.7	0.2	1.2	100	21.9	11.9
01/30/18	0.93	0.7	0.2	1.2	100	25.5	36.3
02/22/18	0.30	0.7	0.2	1.2	100	17.8	35.0
03/26/18	1.25	0.7	0.2	1.3	90	32.5	38.5
04/30/18	0.94	0.7	0.2	1.3	100	32.0	25.5
05/17/18	0.97	0.7	0.2	1.3	100	30.0	38.6
06/21/18	1.14	0.8	0.2	1.3	80	35.2	8.2
07/30/18	0.68	0.8	0.2	1.3	100	25.5	16.3
08/29/18	0.59	0.8	0.2	1.3	100	30.1	26.2
09/25/18	0.97	0.8	0.2	1.3	100	27.6	26.7
10/29/18	0.76	0.8	0.2	1.3	100	32.7	24.8
11/20/18	0.64	0.8	0.3	1.3	100	34.8	15.2

FINAL REPORT

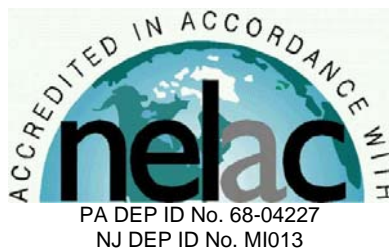
Chronic Toxicity Test
Freshwater Vertebrate,
Pimephales promelas
EPA Test Method 1000.0

Submitted To:
Weston Solutions, Inc.
1090 King George Post Road
Suite 201
Edison, New Jersey 08837

Sample: Tonawanda Coke Corp. - Outfall 004

Testing Period: 13 – 20 December 2018

Laboratory I.D. Number: 121318-9



Conducted By:
Environmental Resources Management, Inc.
3352 128th Avenue
Holland, Michigan 49424



Test Overview



Permittee: Tonawanda Coke Corporation
Location: 3875 River Road
Tonawanda, New York 14150
Contact: Robert Kuberka
Telephone #: 716.876.6222

SPDES Permit #: NY0002399
Permit Requirements: Acute Toxicity Limit = 0.3 TUa
Chronic Toxicity Limit = 1.0 TUc
Test Sample: Outfall 004
Receiving Water: Niagara River

Testing Date: 13 – 20 December 2018

Sample Dates: 12 December 2018
14 December 2018
17 December 2018

Test/Method: Fathead Minnow,
Pimephales promelas, Survival
and Growth Test EPA 821-R-
02-013 Method 1000.0.

QC Objectives: Test data met all test
acceptability criteria, except
where noted below.

Data Qualifiers: See Case Narrative.

DATA SUMMARY

Effluent Concentrations (%)	Survival (%)	Growth Average Wt./ Organism (mg)
Lab Control	87.5	0.572
Upstream Control	95	0.597
6	95	0.619
13	100	0.582
25	97.5	0.586
50	100	0.625
100	97.5	0.603

TEST RESULTS

96-Hour LC ₅₀	>100%
NOEC	100%
LOEC	>100%
IC ₂₅	>100%
MSDp (Reproduction)	22.0%
TUa (100 / LC ₅₀)	0.3
TUc(100/NOEC)	1.0

TEST CONCLUSION

In accordance with the SPDES permit requirements for Tonawanda Coke Corp., this toxicity test did not exhibit either acute or chronic toxicity.

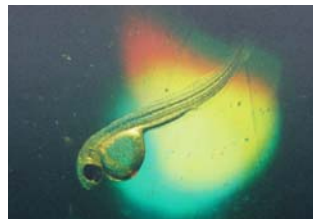
Bruce A. Rabe
Director, Aquatic
Toxicology Laboratory
ERM Project No. 0455217.0142

Environmental Resources Management
3352 128th Avenue
Holland, Michigan 49424-9263
Phone: 616.399.3500
Fax: 616.399.3777



ERM Testing Method

Pimephales promelas – Survival and Growth Toxicity Test



Upon sample receipt, the effluent and receiving water samples were visually inspected for indigenous organisms and analysed for a suite of water quality parameters (Appendix A - Table 1). Where indigenous organisms were present, samples were filtered through a 60 micron (μm) NITEX® screen. All samples were maintained at 0 – 6 degrees Celsius ($^{\circ}\text{C}$) until needed for testing.

A series of five effluent concentrations and two controls (dilution control and laboratory control) were established for testing. Effluent concentrations were prepared by mixing appropriate volumes of dilution water and effluent in the test containers. Dilution water consisted of receiving water. The control solutions consisted of 100 percent receiving water and 100 percent reconstituted moderately hard water.

Pimephales promelas used to initiate this test were obtained from in-house cultures and were less than 24-hours old at test initiation. Test organisms were maintained in reconstituted moderately hard water prior to test initiation.

The *Pimephales promelas* test was conducted using 300 to 500-milliliter (mL) disposable polypropylene containers containing 250 mL of control water or test solution. Ten fish were randomly added to each test chamber with four replicate chambers per treatment. Each *Pimephales promelas* test chamber was fed 0.1 mL of a concentrated suspension of less than 24-hour old live brine shrimp nauplii (*Artemia* sp.) two times per day. Test solutions were renewed daily during the exposure by replacing approximately 90 percent of the 24-hour old solution with fresh control water or appropriate test solution. Prior to test solution renewal, uneaten and dead brine shrimp, along with other debris, were removed from the bottom of the test chambers.

Percent survival of exposed *Pimephales promelas* was determined daily by enumeration of live organisms. Mortality was defined as no body movement after

gentle prodding. At the termination of the chronic test, larvae in each test chamber were counted, dried, and weighed to the nearest 0.01 milligram (mg) on an analytical balance.

The test was conducted at a temperature of $25 \pm 1^{\circ}\text{C}$ under fluorescent lighting with a photoperiod of 16 hours light and 8 hours dark. Water quality measurements were performed on all control and test solutions prior to test initiation and on selected treatments daily thereafter, as indicated in the raw data (Appendix A - Table 2).

Following termination of the chronic toxicity test, No Observed Effect Concentration (NOEC) and Lowest Observed Effect Concentration (LOEC) were determined for both *Pimephales promelas* survival and growth and a 25 percent Inhibition Concentration (IC_{25}) was determined for *Pimephales promelas* growth. The NOEC is defined as the highest effluent concentration which does not produce any observed adverse effect to the exposed test organism whereas the LOEC is defined as the lowest effluent concentration which does produce an observed adverse effect to the exposed test organism. An adverse effect is determined as a statistically significant difference between the control and a given effluent concentration.

Prior to the determination of any significant differences in *Pimephales promelas* survival and growth, the data were evaluated for normal distribution and homogeneity characteristics. Depending on the result and the number of test replicates per concentration, an analysis of variance test was performed, followed by one of the following mean comparison tests: Dunnett's Procedure, Bonferroni t-Test, Steel's Many-One Rank Test, Wilcoxon Rank Sum Test, or the T-Test. For reporting purposes, a chronic toxic unit (TUC) is calculated and is defined as the most conservative of either 100/NOEC based on the most sensitive test endpoint or 100/ IC_{25} .

To evaluate acute toxicity, a 48-hour LC_{50} and corresponding 95 percent confidence interval was also calculated, where possible. If the LC_{50} calculation was not possible (e.g. greater than 50 percent survival) then the 100 percent effluent response was compared to the control for a statistical difference (e.g. T-Test). The LC_{50} value estimate was determined by using one of the following statistical methods: graphical, Spearman-Kärber, Trimmed Spearman-Kärber, or Probit. The method selected for reporting test results was determined by the characteristics of the data; that is, the presence or absence of 0 and 100 percent mortality and the number of concentrations in which mortalities between 0 and 100 percent occurred. For reporting purposes, the 48-hour LC_{50} value was converted to an acute toxic unit (TUa) by $100/LC_{50}$. For 48-hour LC_{50} values greater than 100 percent in which there is a statistical difference between the control and 100 percent effluent, the TUa is reported as 1.0 TUa. In cases where there is no statistical difference between the control and 100 percent effluent, the TUa is reported as 0.3 TUa. All statistical analyses were performed using the CETIS™ Version 1.9.4.3 software program.

The reference toxicant, sodium chloride, was used to monitor the sensitivity of the test organisms. Chronic reference toxicant tests are performed at least monthly and the resulting IC_{25} are plotted to determine if the results are within prescribed limits (Appendix A - Standard Reference Toxicant Data). If the IC_{25} of a particular reference toxicant test does not fall within the expected range of \pm two standard deviations from the mean for a given test organism, the sensitivity of that organism and the overall credibility of the test system is suspect.

Reference:

USEPA. 2002. Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, 4th Ed. U.S. Environmental Protection Agency, Office of Water, Washington, D.C., EPA-821-R-02-013.

Case Narrative



1.0 *TEST PERFORMANCE CRITERIA*

The quality control results achieved laboratory specifications.

2.0 *MODIFICATIONS TO ERM'S STANDARD TEST METHOD*

Test was performed in accordance with ERM's standard test method (see page 3)

3.0 *DATA QUALIFIERS*

Due to shipping issues which caused delay in the receipt of the third effluent sample, sample 2 was used for test renewals beyond the 72-hour holding time limit.

Appendix A
Supporting Documents

- *Raw Test Data*
- *Statistical Analysis (if necessary)*
- *Chain-of-Custody Forms*
- *Standard Reference Toxicant Data*

Permittee/Client: Tonawanda Coke Corp.
Effluent/Location: Outfall 004
Lab I.D.#: 121318-9
Beginning Date: 12/13/18
Ending Date: 12/20/18

Time: 1100
Time: 1100

Control/Dilution Water: RMHW
Organism Batch #: 206-18
Organism Age: 24 hr 5
QC Review: KM
QC Review Date: 12/21/18

Initial Water Quality:

Parameter	Units	Effluent			Upstream Receiving Water			Synthetic Water	
Sample #	--	1	2	3	1	2	3	--	--
Lab I.D.#/ Batch #	--	121318-9	121518-7	121918-2	121318-14	--	--	97-18	--
Temperature	° C	12.0	1	2	3	--	--	--	--
pH	S.U.	7.2	6.8	6.6	7.6	--	--	7.8	--
Conductivity	umhos/cm	407	452	467	346	--	--	332	--
Alkalinity	mg / L CaCO ₃	120	98	120	100	--	--	60	--
Hardness	mg / L CaCO ₃	120	120	120	100	--	--	58	--
Total Ammonia	mg / L NH ₃	0.4	0.4	3.2	0.1	--	--	--	--
Total Residual Chlorine	mg / L Cl ₂	<0.01	<0.01	<0.01	<0.01	--	--	<0.01	--
Total mls of Sodium Thiosulfate added per liter	mg / L	--	--	--	--	--	--	--	--
Initials	--	CM	SPR	SPR	CM	--	--	MS	--

Test Solution Preparation: Test Solution Prepared For Both Species.

Treatment (% Effluent)	Effluent (mL)	Dilution (mL)	Test Day	Initials	Upstream Sample #	Effluent Sample #	Synthetic Batch #
Lab Control	0	1200	0	CM	1	1	97-18
Control - Upstream	0	1200	1	RWM	1	1	97-18
6%	72	1128	2	RW	1	2	97-18
13%	156	1044	3	RW	1	2	97-18
25%	300	900	4	CM RW	1	2	97-18
50%	600	600	5	RW	1	2	97-18
100%	1200	0	6	MS	1	3	97-18
			7	--	--	--	--

Permittee/Client: Tonawanda Coke Corp.
Effluent/Location: Outfall 004
Lab I.D.#: 121318-9

Dissolved Oxygen (mg/L)														
Day														
Meter #	5	3	5	3	5	3	5	5	5	3	3	3	5	5
Treatment	0	1		2		3		4		5		6		7
(% Effluent)	I	F	I	F	I	F	I	F	I	F	I	F	I	F
Lab Control	8.3	6.9	8.3	6.9	8.3	6.0	8.5	7.1	8.5	6.4	8.4	5.7	8.2	7.5
Control - Upstream	8.4	7.1	8.6	6.5	8.4	5.8	8.6	7.3	8.6	6.1	8.4	6.4	8.1	7.7
6%	8.4	7.0	8.3	6.2	8.4	5.6	8.6	7.2	8.6	6.1	8.4	6.0	8.0	7.1
13%	8.4	7.0	8.4	6.5	8.4	5.8	8.6	7.0	8.7	6.1	8.4	5.8	8.0	7.3
25%	8.5	6.9	8.4	6.5	8.4	5.9	8.6	7.0	8.7	6.4	8.3	5.9	8.0	6.2
50%	8.5	7.1	8.4	6.7	8.4	5.9	8.6	7.1	8.7	6.3	8.3	5.9	7.9	6.4
100%	8.5	7.0	8.4	6.7	8.5	5.6	8.6	7.0	8.7	6.2	8.3	5.9	7.7	6.4
pH (S.U.)														
Day														
Meter #	8	10	8	10	8	10	8	8	10	10	10	8	8	8
Treatment	0	1		2		3		4		5		6		7
(% Effluent)	I	F	I	F	I	F	I	F	I	F	I	F	I	F
Lab Control	7.8	7.4	7.9	7.6	7.9	7.8	8.0	7.5	7.8	7.4	7.8	7.2	7.8	7.5
Control - Upstream	7.6	7.8	7.9	7.6	7.9	8.0	7.8	7.8	7.4	7.3	7.5	7.6	7.6	7.6
6%	--	7.8	--	7.6	--	8.0	7.9	7.8	--	7.7	--	7.5	--	7.6
13%	--	7.8	--	7.7	--	8.0	--	7.8	--	7.3	--	7.6	--	7.6
25%	--	7.8	--	7.7	--	8.0	--	7.8	--	7.8	--	7.6	--	7.5
50%	--	7.8	--	7.7	--	8.0	--	7.7	7.7	7.7	--	7.6	--	7.6
100%	7.7	7.8	7.7	7.7	7.8	7.9	7.7	7.7	7.6	7.7	7.6	7.6	7.7	7.5
Conductivity (umhos / cm)														
Day														
Meter #	1	--	1	--	1	--	1	--	1	--	1	--	1	--
Treatment	0	1		2		3		4		5		6		7
(% Effluent)	I	F	I	F	I	F	I	F	I	F	I	F	I	F
Lab Control	326	--	324	--	324	--	327	327	325	--	327	328	--	--
Control - Upstream	329	--	331	--	327	--	325	327	332	--	342	331	--	--
6%	334	--	336	--	338	--	345	335	339	--	357	342	--	--
13%	340	--	342	--	347	--	345	--	348	--	360	351	--	--
25%	351	--	353	--	362	--	361	--	364	--	366	--	370	--
50%	370	--	372	--	396	--	393	--	395	--	398	--	409	--
100%	411	--	414	--	458	--	455	--	458	--	461	--	481	--
Temperature (°C)														
Day														
Meter #	5	3	5	3	5	3	5	5	5	3	3	3	5	5
Treatment	0	1		2		3		4		5		6		7
(% Effluent)	I	F	I	F	I	F	I	F	I	F	I	F	I	F
Lab Control	24	24	24	25	24	24	24	24	24	24	25	24	24	24
Control - Upstream	24	25	24	24	24	24	25	24	24	25	25	24	25	24
6%	24	25	24	25	24	25	25	24	24	24	25	24	25	25
13%	24	25	24	25	24	24	25	24	24	24	25	24	25	24
25%	24	25	24	25	24	25	25	24	24	24	25	24	25	25
50%	24	25	24	25	25	25	25	24	24	24	25	25	25	25
100%	24	25	25	25	25	25	25	24	24	24	25	24	26	25
I = Initial Chemistry F = Final Chemistry														

Note: D.O. meter also used for temperature measurement unless otherwise noted.

Permittee/Client: Tonawanda Coke Corp.
Effluent/Location: Outfall 004
Lab I.D.#: 121318-9

Treatment (% Effluent)	Rep.	# Live Organisms Day									Rep.	# Live Organisms Day									48 Hour Survival Summary		
		0	1	2	3	4	5	6	7	0		1	2	3	4	5	6	7	Initial	Final	%		
		Initial	Final	Survival																			
Lab Control	A	10	10	10	10	10	10	10	10	B	10	10	10	10	10	10	10	40	40	100			
Control - Upstream	A	10	10	10	10	10	10	10	10	B	10	10	10	10	10	10	10	40	39	97.5			
6%	A	10	10	10	10	10	10	10	10	B	10	10	10	10	10	10	10	40	39	97.5			
13%	A	10	10	10	10	10	10	10	10	B	10	10	10	10	10	10	10	40	40	100			
25%	A	10	10	10	10	10	10	10	10	B	10	10	10	10	10	10	10	40	40	100			
50%	A	10	10	10	10	10	10	10	10	B	10	10	10	10	10	10	10	40	40	100			
100%	A	10	10	10	10	10	10	10	10	B	10	10	10	10	10	10	10	40	40	100			

Treatment (% Effluent)	Rep.	# Live Organisms Day 8/21/18									Rep.	# Live Organisms Day 12/14									7 Day Survival Summary		
		0	1	2	3	4	5	6	7	0		1	2	3	4	5	6	7	Initial	Final	%		
		Initial	Final	Survival																			
Lab Control	C	10	10	10	10	10	10	10	9	D	10	10	10	10	10	10	9	40	35	87.5			
Control - Upstream	C	10	10	10	10	10	10	10	10	D	10	9	9	9	9	8	9	40	36	90			
6%	C	10	10	10	10	10	10	10	10	D	10	9	9	9	9	8	9	40	38	95			
13%	C	10	10	10	10	10	10	10	10	D	10	10	10	10	10	10	10	40	40	100			
25%	C	10	10	10	10	10	10	10	10	D	10	10	10	10	10	10	10	40	39	97.5			
50%	C	10	10	10	10	10	10	10	10	D	10	10	10	10	10	10	10	40	40	100			
100%	C	10	10	10	10	10	10	10	10	D	10	10	10	10	10	10	10	40	39	97.5			

Test Information:

	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Time:	1100	1230	1330	1400	1500	1300	1100	
Initials:	CM	LM	EM	SM	MS	JS	MS	APL
Date:	12/13/18	12/14/18	12/15/18	12/16/18	12/17/18	12/18/18	12/19/18	12/20/18

Comment Section:

[illegible]

**Environmental
Resources
Management**

**Pimephales promelas - Chronic Toxicity Test
Growth Data**

Table 3
Page 2 of 2

Permittee/Client: Tonawanda Coke Corp.
Effluent/Location: Outfall 004
Lab I.D.#: 121318-9

Pan #	Conc. (% Effluent)	Replicate	Final Weight (mg)	Initial Weight (mg)	Larvae Weight (mg)	# of Initial Organisms	Avg. Wt./ Organism/ Replicate (mg)	Avg. Wt./ Organism/ Treatment (mg)	Avg. Wt./ Organism/ Treatment % CV
Date			12/21/18	12/17/18					
Analyst			km	km					
1	Lab Control	A	20.01	15.13	4.88	10	0.488		
2	Lab Control	B	20.76	14.71	6.05	10	0.605		
3	Lab Control	C	17.82	12.09	5.73	10	0.573		
4	Lab Control	D	25.14	18.92	6.22	10	0.622	0.572	10.4
5	ontrol - Upstream	A	29.62	22.30	7.32	10	0.732		
6	ontrol - Upstream	B	26.30	20.76	5.54	10	0.554		
7	ontrol - Upstream	C	31.45	25.92	5.53	10	0.553		
8	ontrol - Upstream	D	28.01	22.53	5.48	10	0.548	0.597	15.1
9	6%	A	26.45	20.60	5.85	10	0.585		
10	6%	B	25.45	18.54	6.91	10	0.691		
11	6%	C	30.04	22.72	7.32	10	0.732		
12	6%	D	25.79	21.13	4.66	10	0.466	0.619	19.2
13	13%	A	23.89	18.49	5.40	10	0.540		
14	13%	B	22.34	17.39	4.95	10	0.495		
15	13%	C	25.40	18.95	6.45	10	0.645		
16	13%	D	23.28	16.82	6.46	10	0.646	0.582	13.1
17	25%	A	24.29	18.46	5.83	10	0.583		
18	25%	B	24.79	18.80	5.99	10	0.599		
19	25%	C	27.09	20.86	6.23	10	0.623		
20	25%	D	23.37	17.97	5.40	10	0.540	0.586	6.0
21	50%	A	23.35	16.46	6.89	10	0.689		
22	50%	B	22.64	16.43	6.21	10	0.621		
23	50%	C	22.19	16.02	6.17	10	0.617		
24	50%	D	26.94	21.20	5.74	10	0.574	0.625	7.6
21	100%	A	23.03	16.91	6.12	10	0.612		
22	100%	B	22.31	17.22	5.09	10	0.509		
23	100%	C	23.96	17.39	6.57	10	0.657		
24	100%	D	23.87	17.55	6.32	10	0.632	0.603	10.8

Quality Assurance			Final Wt. (mg)		
25	Blank	A	10.57	10.57	0.00
26	Blank	B	11.33	11.29	0.04

CETIS Analytical Report

Report Date: 21 Dec-18 13:15 (p 1 of 2)
Test Code/ID: 45748A93 / 11-6526-5555

Fathead Minnow 7-d Larval Survival and Growth Test

ERM

Analysis ID: 11-7334-4721	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.9.4
Analyzed: 21 Dec-18 13:14	Analysis: Parametric-Control vs Treatments	Status Level: 1
Batch ID: 20-5476-8077	Test Type: Growth-Survival (7d)	Analyst: Lab Tech
Start Date: 13 Dec-18 11:00	Protocol: EPA/821/R-02-013 (2002)	Diluent: Receiving Water
Ending Date: 20 Dec-18 11:00	Species: Pimephales promelas	Brine:
Test Length: 7d 0h	Taxon: Actinopterygii	Source: In-House Culture Age: <24
Sample ID: 10-4507-0296	Code: 3E4A81D8	Project: WET Compliance Testing
Sample Date: 12 Dec-18 09:25	Material: Industrial Effluent	Source: Tonawanda Coke Corp.
Receipt Date: 13 Dec-18 10:00	CAS (PC):	Station: Outfall 004
Sample Age: 26h (2 °C)	Client: Tonawanda Coke Corp.	

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	C > T	100	>100	n/a	1	22.04%

Dunnett Multiple Comparison Test

Control	vs	Conc-%	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Upstream Contr		6	-0.3981	2.407	0.132	6	CDF	0.9242	Non-Significant Effect
		13	0.2792	2.407	0.132	6	CDF	0.7383	Non-Significant Effect
		25	0.1922	2.407	0.132	6	CDF	0.7705	Non-Significant Effect
		50	-0.5217	2.407	0.132	6	CDF	0.9425	Non-Significant Effect
		100	-0.1053	2.407	0.132	6	CDF	0.8624	Non-Significant Effect

Test Acceptability Criteria

TAC Limits

Attribute	Test Stat	Lower	Upper	Overlap	Decision
Control Resp	0.5968	0.25	>>	Yes	Passes Criteria

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.0060347	0.0012069	5	0.2022	0.9573	Non-Significant Effect
Error	0.107437	0.0059687	18			
Total	0.113472		23			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	4.67	15.09	0.4575	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.98	0.884	0.8958	Normal Distribution

Mean Dry Biomass-mg Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	U	4	0.5968	0.4532	0.7403	0.5535	0.548	0.732	0.0451	15.12%	0.00%
6		4	0.6185	0.4291	0.8079	0.638	0.466	0.732	0.05952	19.25%	-3.64%
13		4	0.5815	0.4603	0.7027	0.5925	0.495	0.646	0.03808	13.10%	2.56%
25		4	0.5863	0.5307	0.6418	0.591	0.54	0.623	0.01747	5.96%	1.76%
50		4	0.6253	0.5496	0.7009	0.619	0.574	0.689	0.02376	7.60%	-4.78%
100		4	0.6025	0.4991	0.7059	0.622	0.509	0.657	0.0325	10.79%	-0.96%

Mean Dry Biomass-mg Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	U	0.732	0.554	0.553	0.548
6		0.585	0.691	0.732	0.466
13		0.54	0.495	0.645	0.646
25		0.583	0.599	0.623	0.54
50		0.689	0.621	0.617	0.574
100		0.612	0.509	0.657	0.632

CETIS Analytical Report

Report Date: 21 Dec-18 13:15 (p 2 of 2)
Test Code/ID: 45748A93 / 11-6526-5555

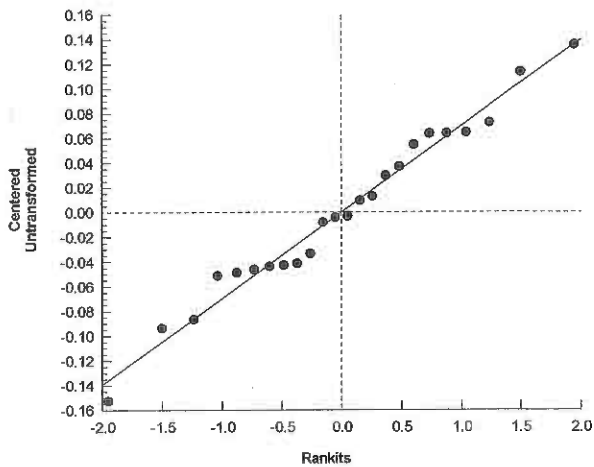
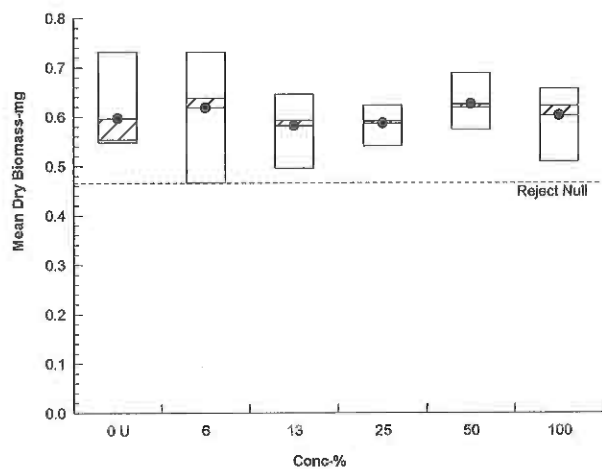
Fathead Minnow 7-d Larval Survival and Growth Test

ERM

Analysis ID: 11-7334-4721 Endpoint: Mean Dry Biomass-mg
Analyzed: 21 Dec-18 13:14 Analysis: Parametric-Control vs Treatments

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 21 Dec-18 13:15 (p 1 of 2)
Test Code/ID: 45748A93 / 11-6526-5555

Fathead Minnow 7-d Larval Survival and Growth Test

ERM

Analysis ID: 01-3367-2131	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETISv1.9.4
Analyzed: 21 Dec-18 13:14	Analysis: Linear Interpolation (ICPIN)	Status Level: 1
Batch ID: 20-5476-8077	Test Type: Growth-Survival (7d)	Analyst: Lab Tech
Start Date: 13 Dec-18 11:00	Protocol: EPA/821/R-02-013 (2002)	Diluent: Receiving Water
Ending Date: 20 Dec-18 11:00	Species: Pimephales promelas	Brine:
Test Length: 7d 0h	Taxon: Actinopterygii	Source: In-House Culture Age: <24
Sample ID: 10-4507-0296	Code: 3E4A81D8	Project: WET Compliance Testing
Sample Date: 12 Dec-18 09:25	Material: Industrial Effluent	Source: Tonawanda Coke Corp.
Receipt Date: 13 Dec-18 10:00	CAS (PC):	Station: Outfall 004
Sample Age: 26h (2 °C)	Client: Tonawanda Coke Corp.	

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Log(X+1)	Linear	691684	200	Yes	Two-Point Interpolation

Test Acceptability Criteria

		TAC Limits		Overlap	Decision
Attribute	Test Stat	Lower	Upper		
Control Resp	0.5968	0.25	>>	Yes	Passes Criteria

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC5	>100	n/a	n/a	<1	n/a	n/a
IC10	>100	n/a	n/a	<1	n/a	n/a
IC15	>100	n/a	n/a	<1	n/a	n/a
IC20	>100	n/a	n/a	<1	n/a	n/a
IC25	>100	n/a	n/a	<1	n/a	n/a
IC40	>100	n/a	n/a	<1	n/a	n/a
IC50	>100	n/a	n/a	<1	n/a	n/a

Mean Dry Biomass-mg Summary

			Calculated Variate						Isotonic Variate	
Conc-%	Code	Count	Mean	Min	Max	Std Dev	CV%	%Effect	Mean	%Effect
0	U	4	0.5968	0.548	0.732	0.0902	15.12%	0.0%	0.6076	0.0%
6		4	0.6185	0.466	0.732	0.119	19.25%	-3.65%	0.6076	0.0%
13		4	0.5815	0.495	0.646	0.07615	13.10%	2.56%	0.5989	1.44%
25		4	0.5863	0.54	0.623	0.03494	5.96%	1.76%	0.5989	1.44%
50		4	0.6253	0.574	0.689	0.04753	7.60%	-4.78%	0.5989	1.44%
100		4	0.6025	0.509	0.657	0.06499	10.79%	-0.96%	0.5989	1.44%

Mean Dry Biomass-mg Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	U	0.732	0.554	0.553	0.548
6		0.585	0.691	0.732	0.466
13		0.54	0.495	0.645	0.646
25		0.583	0.599	0.623	0.54
50		0.689	0.621	0.617	0.574
100		0.612	0.509	0.657	0.632

CETIS Analytical Report

Report Date: 21 Dec-18 13:15 (p 2 of 2)
Test Code/ID: 45748A93 / 11-6526-5555

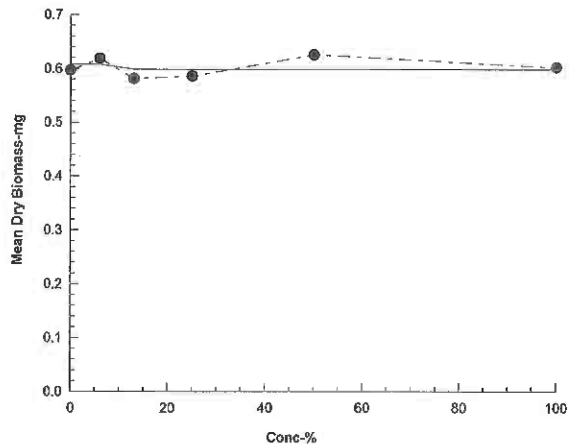
Fathead Minnow 7-d Larval Survival and Growth Test

ERM

Analysis ID: 01-3367-2131 Endpoint: Mean Dry Biomass-mg
Analyzed: 21 Dec-18 13:14 Analysis: Linear Interpolation (ICPIN)

CETIS Version: CETISv1.9.4
Status Level: 1

Graphics



CHAIN OF CUSTODY RECORD

No: 2-121218-132004-0013

Case #:

DateShipped: 12/12/2018

Cooler #: 1

Contact Name: Tim Benton

Lab: Environmental Resources Management

Contact Phone: (732) 585-4425

Lab Phone: 616-399-3500

AirbillNo: 773951939200

[illegible]

Special Instructions: Chronic Toxicity Test - Method: EPA-821-R-02-013

Daphnid - Method 1002.0

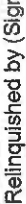

Fathead Minnow - Methd 1000.0

48 Hour Prelim Results: Two weeks written. Email Results to

Tim.Benton@WestonSolutions.com and Patrick.Buster@WestonSolutions.com

SAMPLES TRANSFERRED FROM

CHAIN OF CUSTODY

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
1/ sample	 R. B. Weston	12/12/18 1500	 R. B. Weston	12/14/18 1000	

CHAIN OF CUSTODY RECORD

Case #:

Contact Name: Tim Benton

Contact Phone: (732) 585-4425

No: 2-121418-114000-0018


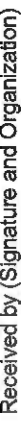
Cooler #: 1

Lab: Environmental Resources Management

Lab Phone: 616-399-3500

[illegible]

<p>Special Instructions: Chronic Toxicity Test - Method: EPA-821-R-02-013</p> <p>Daphnid - Method 1002.0</p> <p>Fathead Minnow - Method 1000.0</p> <p>48 Hour Prelim Results, Two weeks written. Email Results to Tim.Benton@WestonSolutions.com and Patrick.Buster@WestonSolutions.com</p>	<p>SAMPLES TRANSFERRED FROM</p> <hr/> <p>CHAIN OF CUSTODY #</p>
--	---

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
1/Sample	 WESTON	12/14/18 1500	FedEx		
			 Adam Nagel	12/15/18 1000	Cold

DateShipped: 12/17/2018

CarrierName: FedEx

AirbillNo: 773999646440

CHAIN OF CUSTODY RECORD

Case #:

Contact Name: Tim Benton

Contact Phone: (732) 585-4425

No: 2-121718-114628-0019

Cooler #: 1

Lab: Environmental Resources Management

Lab Phone: 616-399-3500

[illegible]

Special Instructions: Chronic Toxicity Test - Method: EPA-821-R-02-013

Daphnid - Method 1002.0


Fathead Minnow - Methd 1000.0

48 Hour Prelim Results, Two weeks written. Email Results to

Tim.Benton@WestonSolutions.com and Patrick.Buster@WestonSolutions.com

SAMPLES TRANSFERRED FROM

CHAIN OF CUSTODY #

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
1/sample	 T. Weston	12/17/18 1500	FedEx		
			Colleen Nagel/Team	12/19/18 1030	* out of hold free
					FedEx Express/Team

CHAIN OF CUSTODY RECORD

Case #:

Contact Name: Tim Benton

Contact Phone: (732) 585-4425

No: 2-121218-132541-0014

Cooler #: 2

Lab: Environmental Resources Management

Lab Phone: 616-399-3500

[illegible]

Special Instructions: Chronic Toxicity Test - Method: EPA-821-R-02-013

Daphnid - Method 1002.0

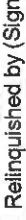

Fathead Minnow - Methd 1000.0

48 Hour Prelim Results, Two weeks written. Email Results to

Tim.Benton@WestonSolutions.com and Patrick.Buster@WestonSolutions.com

SAMPLES TRANSFERRED FROM

CHAIN OF CUSTODY #

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
✓ Sample	 T. WESTON	12/16/10 1500	 R. Ryan	12/13/18 1000	

CHAIN OF CUSTODY RECORD

Case #:

Contact Name: Tim Benton

Contact Phone: (732) 585-4425

Cooler #: 3

Lab: Environmental Resources Management

Lab Phone: 616-399-3500

Special Instructions: Chronic Toxicity Test - Method: EPA-821-R-02-013 Daphnid - Method 1002.0 Fathead Minnow - Method 1000.0 48 Hour Prelim Results, Two weeks written. Email Results to Tim.Benton@WestonSolutions.com and Patrick.Buster@WestonSolutions.com	SAMPLES TRANSFERRED FROM
	CHAIN OF CUSTODY #

121318-9 Pp
Page 19 of 22

CHAIN OF CUSTODY RECORD

Case #:

Contact Name: Tim Benton

Contact Phone: (732) 585-4425

Cooler #: 4

Lab: Environmental Resources Management

Lab Phone: 616-399-3500

[illegible]

Special Instructions: Chronic Toxicity Test - Method: EPA-821-R-02-013



Daphnid - Method 1002.0

Fathead Minnow - Methd 1000.0

48 Hour Prelim Results, Two weeks written. Email Results to

Tim.Benton@WestonSolutions.com and Patrick.Buster@WestonSolutions.com

<p>Special Instructions: Chronic Toxicity Test - Method: EPA-821-R-02-013</p> <p>Daphnid - Method 1002.0</p> <p>Fathead Minnow - Method 1000.0</p> <p>48 Hour Prelim Results, Two weeks written. Email Results to Tim.Benton@WesternSolutions.com and Patrick.Buster@WesternSolutions.com</p>	<p>SAMPLES TRANSFERRED FROM</p>
	<p>CHAIN OF CUSTODY #</p>

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
1 sample	 R. F. WESTON	12/12/18 1500	 Remy	12/13/18 1000	

CHAIN OF CUSTODY RECORD

Case #:

Contact Name: Tim Benton

Contact Phone: (732) 585-4425

No: 2-121218-132857-0017

Cooler #:

Lab: Environmental Resources Management

Lab Phone: 616-399-3500

[illegible]

Special Instructions: Chronic Toxicity Test - Method: EPA-821-R-02-013



Daphnid - Method 1002.0

Fathead Minnow - Method 1000.0

48 Hour Prelim Results, Two weeks written. Email Results to

Tim.Benton@WestonSolutions.com and Patrick.Buster@WestonSolutions.com

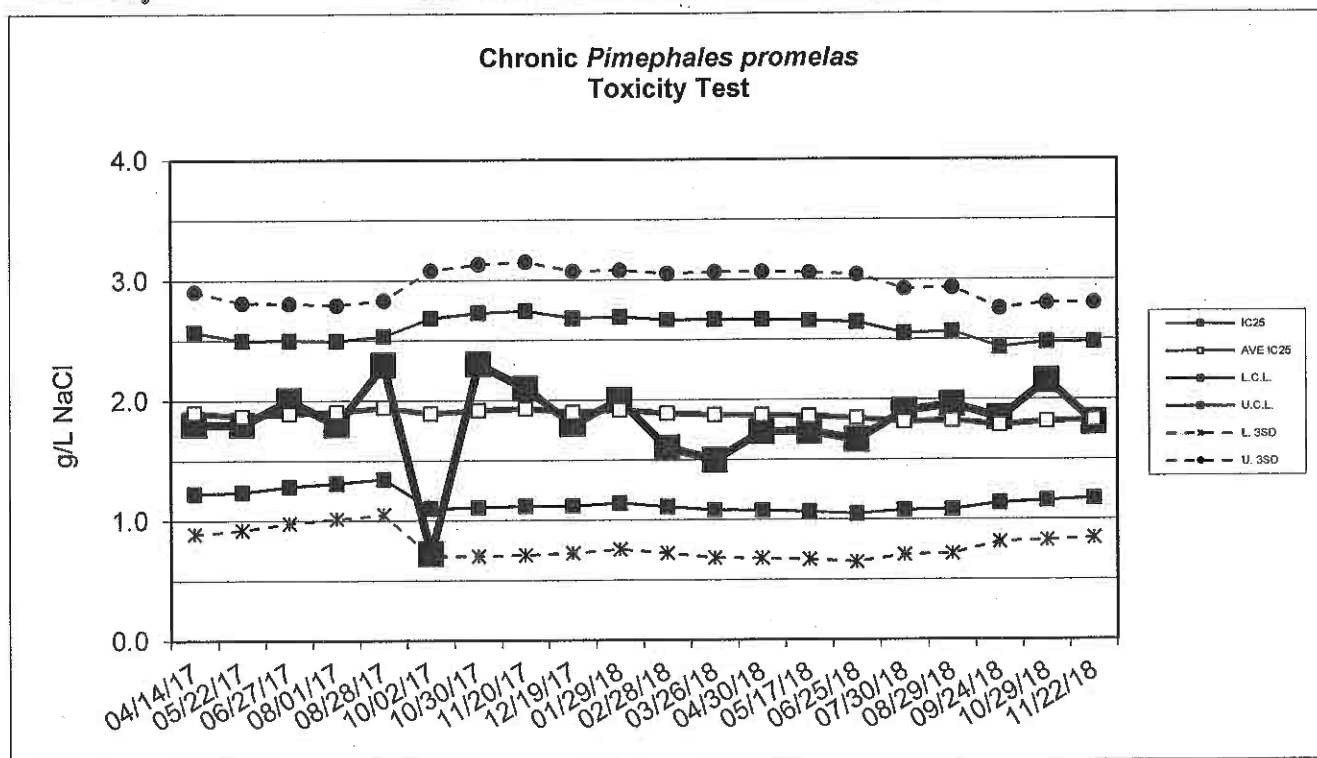
SAMPLES TRANSFERRED FROM	CHAIN OF CUSTODY #

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
1/ Sample	 T. Weston	12/12/18	 T. Weston	12/13/18 1:00	



Environmental Resources Management

Standard Reference Toxicant Data



Chronic *Pimephales promelas* Toxicity Test Data

Date	IC25 (g/L NaCl)	AVE IC25 (g/L NaCl)	CONTROL LIMIT		Survival (%)	CONTROL Growth (mg)	CV (%)
			Lower	Upper			
04/14/17	1.8	1.9	1.2	2.6	95	0.43	3.7
05/22/17	1.8	1.9	1.2	2.5	97.5	0.35	3.0
06/27/17	2.0	1.9	1.3	2.5	95	0.54	17.0
08/01/17	1.8	1.9	1.3	2.5	100	0.52	9.8
08/28/17	2.3	1.9	1.3	2.5	97.5	0.50	2.6
10/02/17	0.7	1.9	1.1	2.7	82.5	0.49	23.4
10/30/17	2.3	1.9	1.1	2.7	92.5	0.46	20.6
11/20/17	2.1	1.9	1.1	2.7	85	0.39	7.1
12/19/17	1.8	1.9	1.1	2.7	100	0.58	5.3
01/29/18	2.0	1.9	1.1	2.7	97.5	0.39	4.8
02/28/18	1.6	1.9	1.1	2.7	92.5	0.44	10.7
03/26/18	1.5	1.9	1.1	2.7	97.5	0.47	3.5
04/30/18	1.7	1.9	1.1	2.7	95	0.45	11.4
05/17/18	1.7	1.9	1.1	2.7	100	0.54	10.8
06/25/18	1.7	1.8	1.0	2.6	95	0.56	17.8
07/30/18	1.9	1.8	1.1	2.6	97.5	0.43	4.3
08/29/18	2.0	1.8	1.1	2.6	100	0.58	9.4
09/24/18	1.8	1.8	1.1	2.4	97.5	0.46	8.2
10/29/18	2.2	1.8	1.2	2.5	97.5	0.45	7.7
11/22/18	1.8	1.8	1.2	2.5	95	0.65	5.2